

# (12) UK Patent Application (19) GB (11) 2 289 758 (13) A

(43) Date of A Publication 29.11.1995

(21) Application No 9508068.5

(22) Date of Filing 20.04.1995

(30) Priority Data

(31) 06006955 (32) 24.05.1994 (33) JP

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(51) INT CL<sup>6</sup>

**G01N 25/04**

(52) UK CL (Edition N )

**G1D DHX**

**U1S S1453**

(56) Documents Cited

**US 3946594 A**

(58) Field of Search

UK CL (Edition N ) **G1D DHX , G1N NADCD**

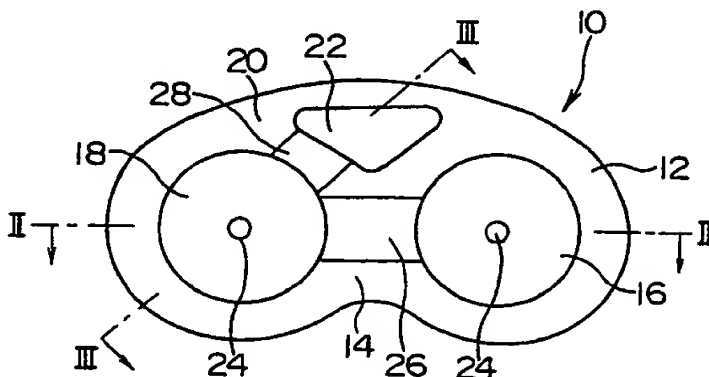
INT CL<sup>6</sup> **G01N 25/00 25/02 25/04**

**ONLINE:WPI**

(54) **Sampling vessel for thermal analysis**

(57) A sampling vessel to be used for analyzing molten metals has a pair of sampling cavities 16, 18 and a sampling sump 22 separated by a first and second partition walls 14, 20 from each other. The upper surface of the first partition wall is provided with a first groove 26 so as to guide the melt from the first cavity 16 to the second cavity 18 and the upper surface of the second partition wall 20 is provided with a second groove 28 so as to guide excess melt in the second sampling cavity to the sump 22.

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FIG. 1

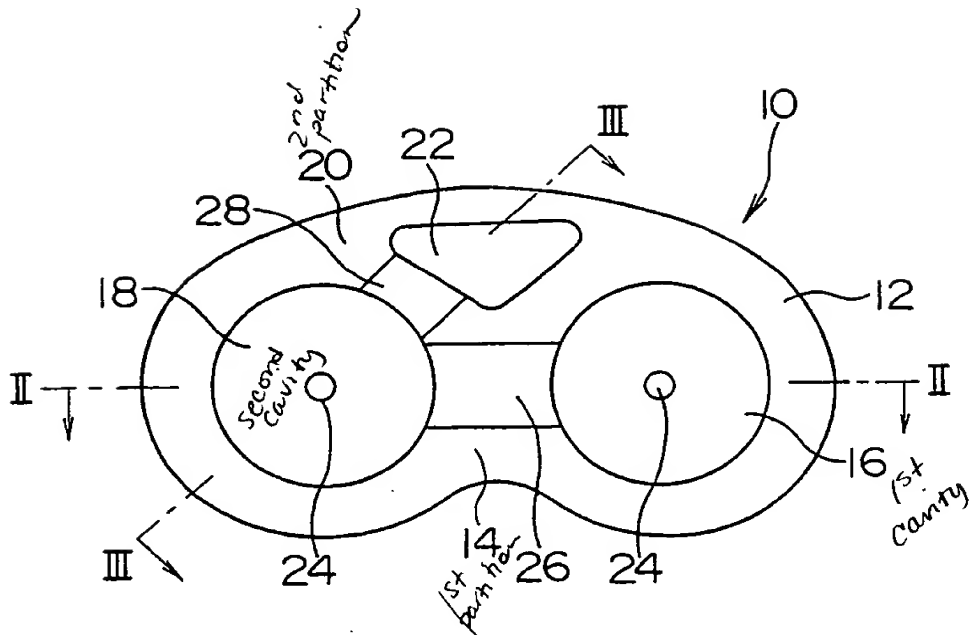


FIG. 2

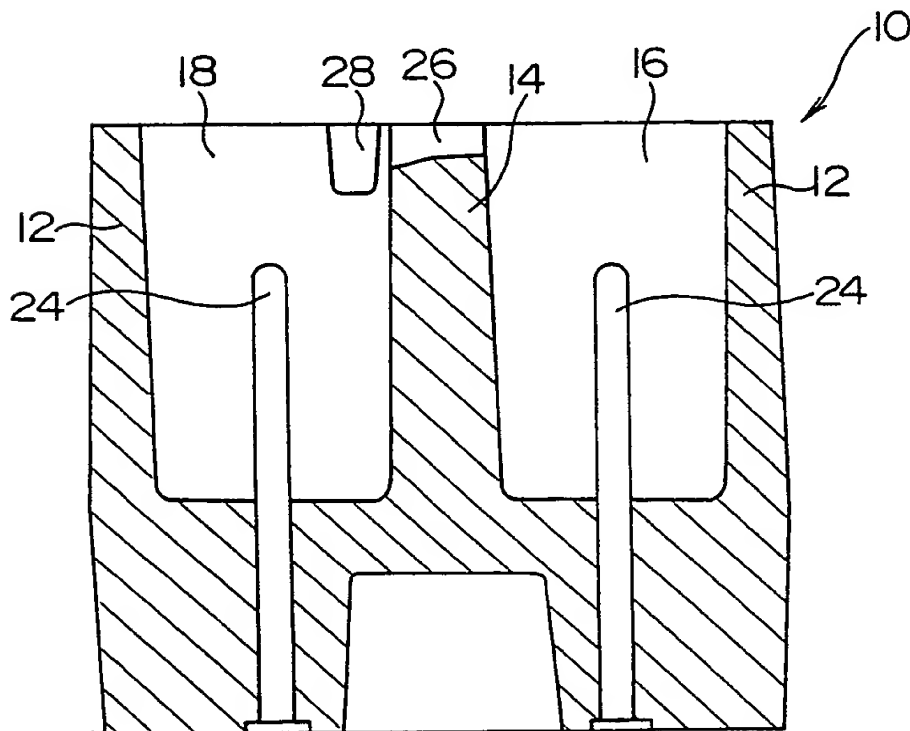
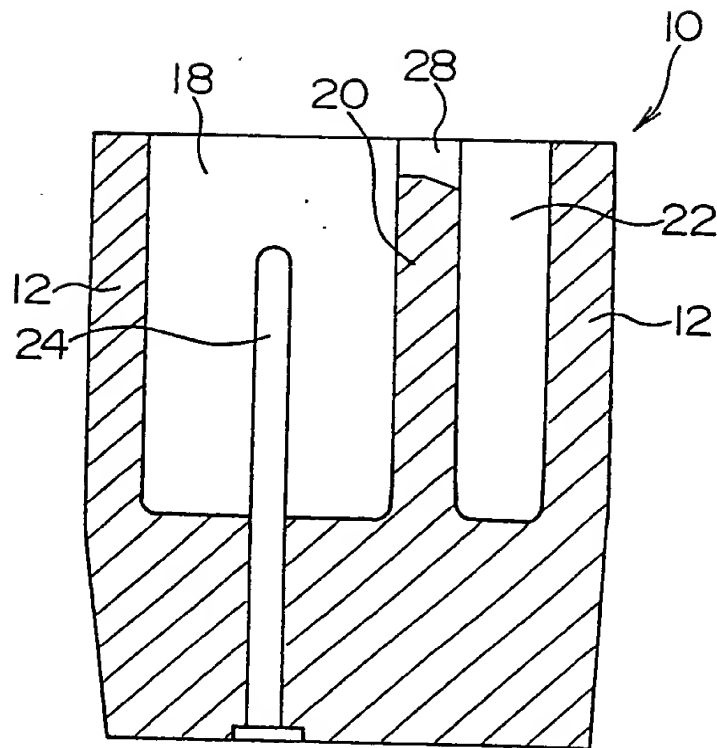


FIG. 3



**2289758**

SAMPLING VESSEL FOR THERMAL ANALYSIS OF METAL MELTS

FILED OF THE INVENTION

This invention relates to sampling vessels for thermal analysis of metal melts, and more particularly to sampling vessels for determining property of molten iron or steel in performing the thermal analysis of the melt.

STATE OF ART

Metallurgical structure or property of melts of cast iron or steel is usually investigated by thermal analysis of the melt at the outside of the furnace before pouring the melt in a mold.

The conventional thermal analysis of metal melts, particularly the melt of cast iron or steel, requires the use of a sampling vessel made of heat resistance material such as, for example ceramics in the shape of cup having a thermocouple connected to an automatic recorder in order to examine a cooling curve of the melt.

Hidetaka Hiraoka et al. Japanese Patent Application No. 5-280664 filed on October 15, 1993 and a corresponding UK Patent Application No. 9420592.9 filed on October 12, 1994 disclose methods for inspecting the content of structure modifying additives in molten cast iron and chilling tendency of flaky graphite cast iron by using a pair of sampling vessels one of which has in its sampling vessel a small quantity of tellurium and the other sampling vessel is free of tellurium, by pouring the molten iron

or steel in each of the sampling vessels to obtain two separate samples of the melt, and by comparing the cooling curves obtained from the thermal analysis of the sample in each of the vessels.

On pouring the metal melt into the sampling vessel, a constant quantity of the melt may not always filled in the vessel. Usually, the sampling vessel was overflowed with the melt. However, the quantity of the melt in the sampling vessel depends on the rate of pouring. If the speed for pouring the melt into the sampling vessel is low, the surface of the melt in the vessel will rise, and if the speed is high, the quantity of the melt to be poured into the vessel will insufficient.

If the quantity of the melt in each of the vessels is different from each other, this is influenced significantly to the accuracy of the thermal analysis.

If the vessel is overflowed with the melt, a portion of the melt will be spraying over the floor and will give the operator trouble.

#### OBJECTS OF THE INVENTION

In view of the above, it is a principal object of the invention to provide a sampling vessel having a pair of sampling cavities one of which is used for thermally analysis of the melt containing tellurium and the other sampling cavity is used for thermally analyzing the melt which is free of tellurium.

It is a further object of the invention provide a sampling vessel having a pair of sampling cavities and a melt sump for preventing the excess melt from the sampling cavities to the

outside of the sampling vessel.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a plan view of the sampling vessel of the present invention to be used for thermal analysis of metal melts;

Figure 2 is a sectional view taken in the direction of the arrows substantially along the line II - II of Figure 1; and

Figure 3 is a sectional view taken in the direction of the arrows substantially along the line III - III of Figure 1.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the attached drawings, as shown in Figure 1, a sampling vessel 10 of the present invention is made of thermal resistant material as the same as the usual one and has a thick wall 12.

The vessel 10 is separated by a first partition wall 14 and a second partition wall 20 so as to form a pair of sampling cavities 16 and 18 and a sampling sump 22.

As in the same manner as the conventional sampling vessel, a probe 24 including a thermocouple is protruded from the bottom of each of the first and second sampling cavities 16 ; 18.

The thermocouple leads (not shown) are connected with a measuring instrument or indicator, for example a temperature recorder (not shown) which plots a cooling curve from which the freezing point of a sample of the melt can be read off.

The first partition wall 14 separates the first sampling cavity 16 from the second sampling cavity 18 and in the upper surface of the wall 14 is provided with a first groove 26 so as

to guide and flow the melt poured into the first sampling cavity 16 to the second sampling cavity 18 when the first sampling cavity 16 is filled with full of the melt.

In the same manner, in the upper surface of wall 20 for separating the second sampling cavity 18 and the melt sump 22, there is provided a second groove 28 so as to guide and flow an excess melt supplied to the second sampling cavity 18 into the melt sump 22.

In order to compare the result of thermal analysis of the molten metal containing tellurium and the molten metal without containing additive, a desired amount of tellurium is placed in the first sampling cavity 16 of the vessel 10 according to the invention.

In supplying the melt into the first sampling cavity 16 continuously, the first cavity 16 is filled with the melt, and then the melt will be supplied to the second sampling cavity 18 passing through the first groove 26 to fill with it to the brim and excess melt will flow into the melt sump 22 passing through the second groove 28 formed in the upper surface of the second wall 20.

Consequently, by using the sampling vessel 10 of the present invention, it is possible to supply a constant volume of the metal melt in each of the first and second sampling cavities 16 and 18, and then the excess of the melt to be supplied to the vessel 10 is entered into the melt sump 22 so that the melt will not be scattered in all directions on the floor.

## **CLAIMS**

1. A sampling vessel for thermal analysis of metal melts comprising a first sampling cavity and a second sampling cavity separated from each other by means of a first partition wall, a melt sump separated from these sampling cavities by means of a second partition wall, a first groove formed in the upper surface of the first partition wall so as to flow the melt from the first sampling cavity to the second sampling cavity when the first sampling cavity is filled with full of the melt and a second groove formed in the upper surface of the second partition wall so as to flow an excess melt from the second sampling cavity to the melt sump.
2. A sampling vessel for thermal analysis of metal melts substantially as herein described with reference to and as illustrated in the accompanying drawings.
3. A method for thermally analysing metal melts including using a sampling vessel according to claim 1 or 2.
4. A method for thermally analysing metal melts substantially as described herein with reference to the accompanying drawings.



Patents Act 1977  
Examiner's report to the Comptroller under Section 17  
(The Search report)

Application number  
GB 9508068.5

Relevant Technical Fields

- (i) UK Cl (Ed.N) G1D (DHX); G1N (NADCD)  
(ii) Int Cl (Ed.6) G01N 25/00 25/02 25/04

Search Examiner  
A BURROWS

Date of completion of Search  
12 JULY 1995

Databases (see below)

- (i) UK Patent Office collections of GB, EP, WO and US patent specifications.  
(ii) ONLINE: WPI

Documents considered relevant following a search in respect of Claims :-  
1-4

Categories of documents

- X: Document indicating lack of novelty or of inventive step. P: Document published on or after the declared priority date but before the filing date of the present application.  
Y: Document indicating lack of inventive step if combined with one or more other documents of the same category. E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.  
A: Document indicating technological background and/or state of the art. &: Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages	Relevant to claim(s)
X	US 3946594 (ELECTRO-NITE) Figure 1; lines 39-46 column 4	1, 3

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